

MAC Learning and Switch Forwarding

Recommended time: 45-60 minutes | Focus: Source learning, flooding, known unicast, VLAN scope

Learning Objectives

1. Explain source MAC learning.
2. Distinguish unknown-unicast flooding from known-unicast forwarding.
3. Explain why switching behavior is scoped to a VLAN.
4. Interpret a simple MAC address table as evidence.

Teacher design rule: Require a prediction before configuration and an explanation after verification. A working fix without supported reasoning is still useful formative-assessment evidence.

Setup

PC-A is on port 1 in VLAN 10. PC-B is on port 2 in VLAN 10. PC-C is on port 3 in VLAN 10. Begin with an empty MAC table.

Prediction Before Traffic

PC-A sends a frame to PC-B. Ask what the switch learns and what it does if PC-B's destination MAC is unknown.

Expected: learn PC-A's source MAC on port 1; flood the unknown-unicast frame to eligible VLAN 10 ports except the ingress port.

Reply Frame

PC-B replies to PC-A. The switch learns PC-B's source MAC on port 2 and can forward specifically to port 1 because PC-A is already known.

Evidence Artifact

VLAN 10 MAC table after exchange: AA:AA:AA:AA:AA:AA → port 1; BB:BB:BB:BB:BB:BB → port 2.

Misconception to Expose

Incorrect: "The switch learns the destination MAC from the arriving frame."

Correction: the switch learns from the source MAC address of received frames.

Changed-Fact Drill

Move PC-B to VLAN 20. Ask whether ordinary Layer 2 switching alone can deliver traffic between PC-A and PC-B.

Answer: no. Inter-VLAN communication requires Layer 3 forwarding.

Exit Ticket

In four sentences explain: source learning → first-frame flooding → reply learning → known-unicast forwarding.

Quick Assessment Rubric

Criterion	Strong Evidence
Prediction	States the expected network behavior or artifact before the change.
Interpretation	Explains what the evidence proves and what remains unresolved.
Decision	Changes only what the evidence supports.
Verification	Repeats the original test and includes a control or negative test when appropriate.

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